REMARKS

CLAIM OBJECTIONS

Claims 11 – 13 have been amended to remove multiple dependencies.

CLAIM REJECTION UNDER 35 USC §102

Claims 1, 3 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Ebdon (U.S. Patent 3,189,989).

Method claim 1 has been amended to recite a continuous method for producing a lead alloy strip having high initial tensile strength and high elongation before yield greater than 40% for battery electrode plates comprising heating a lead alloy to a temperature above the melting point of the lead alloy for feeding of molten lead alloy to an extruder having a die block with a desired die profile, cooling the molten lead alloy below the melting point of the lead alloy, forcing the lead alloy through the die block at a pressure up to 2000 atmospheres to produce an extrusion with zero porosity having a desired strip profile and a homogeneous, equiaxed lead alloy grain structure, and rapidly cooling the extrusion while maintaining the extrusion under tension by quenching to acquire a strip having a homogeneous, equiaxed lead alloy grain structure with a predetermined grain size in the range of 10 to 300 microns. The underlined subject matter in rewritten claim 1 receives full antecedent support in the description of the method of the invention as filed.

Ebdon discloses lead alloy sheeting produced by extruding lead or a lead alloy and rolling the sheet to produce a sheet. Ebdon does not produce a strip. The size range of 1 to 100 microns relates to the size of the initial lead particles (col. 2, lines 43 – 47). It is believed claim 1 as amended and its dependent claims 3 and 4 clearly are not anticipated by this reference.

Claims 1, 3 – 5 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by McWhinnie (U.S. Patent 4,332,629).

McWhinnie is described in applicants' specification (page 2, lines 15 – 21) to produce a lead-antimony strip including negative corrosion characteristics and undesired grid growth due to extrusion by batch ram press extrusion at a low speed of 6 – 10 ft/min. In distinction, applicants' strip, a lead-calcium-tin-strip (new claims 14 and 15), is a zero porosity strip having high initial tensile strength and high elongation before yield of greater than 40% with a homogeneous equiaxed grain structure in the size range of 10 to 300 microns. With reference to Example III and Figure 8, applicants' extrusion (Extruded Strip) showed significant reductions in vertical growth and corrosion weight loss compared to continuous cast, commercial rolled and book mold grids.

Applicants use a continuous extrusion process utilizing a screwhousing for continuous introduction of molten lead alloy and close temperature control within the housing for cooling the molten lead alloy to a temperature below the lead alloy melting point prior to extrusion (claim 5) at a high commercial rate of up to 150 ft/min., depending on the alloy chosen (equivalent to 23 – 30 kg/min. for ternary and quaternary alloys and up to 50 kg/min for lead and lead binary alloys of Pb-Sn – page 10, lines 11 – 29).

Claim 1 as amended, and dependent claims 3 – 5 and 8 accordingly are believed not anticipated by McWhinnie.

Claim 5 dependent on claim 1 has been amended to clearly distinguish over McWhinnie. Claim 5 receives full antecedent support in reciting a method in which the lead alloy is heated to a temperature in a <u>temperature range from the melting point of the lead alloy up to 380°C</u> for <u>feeding of molten lead alloy</u> to the extruder <u>having a screwhousing</u>, <u>cooling the molten lead alloy within the screwhousing to a temperature below the melting point of the lead alloy</u> <u>for extrusion of the lead alloy through the die block</u>, rapidly cooling the extruded strip under tension <u>by quenching</u> and <u>winding the cooled extruded strip into a coil</u>.

Claims 1, 3 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by Hofmann (Chem. Abs. "Creep Behavior or Lead and Lead Alloys in Practical Application", Freiberger Forschungshefte 1964).

Applicants' claim 1 has been amended as described above. In addition, claim 1 has been amended to recite rapid cooling of the strip by quenching while under tension to produce a homogeneous, equiaxed lead alloy grain structure (page 3, lines 10 – 15 and page 4, lines 7 – 11), not disclosed or suggested in Hofmann.

Claims 2, 6 – 7 and 9 – 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over McWhinnie (U.S. Patent 4,332,629) in view of applicant's disclosure of the prior art.

Claim 6 has been amended to include expanding slit and cooled planar strip into an expanded diamond grid mesh by rotary expansion to produce a diamond shape having a ratio of height of the diamond to the width of the diamond of up to almost 1. As described in paragraph 7, lines 6 – 17 of page 6 of applicants' specification, the high tensile strength and high elongation of greater than 40% before yield of applicants' extruded strip allows the use of higher elongation than previously attained, thereby permitting the production of an almost square battery grid mesh having a height of diamond (SWD) to width of diamond (LWD) ratio of almost 1. Conventional elongation of lead alloy strip is limited to an SWD/LWD ratio of much less than 1.

Product claim 11 recites a novel extruded lead alloy strip produced by the method of any of claims 1 through 9 in which the lead alloy strip has zero porosity and high initial tensile strength and high elongation before yield greater than 40% with a homogeneous, equiaxed grain structure in the size range of 10 to 300 microns. Physical characteristics underlined have full antecedent support in the specification as filed. Product claim 12 claims an expanded diamond-mesh grid having a ratio of diamond height to diamond width not heretofore achieved from expanded lead or lead-alloy strip.

The alloy compositions recited in new claims 14 and 15 receive full antecedent support in the specification in the paragraph bridging pages 9 and 10 of the specification.

Jin (U.S. Patent 5,964,901) is cited to show the level of ordinary skill in the art. This reference discloses heat treatment of a dispersion-hardened lead sheet to achieve a grain growth yielding an average grain size of at least 50 μm, preferably at least 100 or 200 μm. The lead contains dispersoid particles selected from inorganic materials, substantially insoluble in lead and sulfuric acid. Applicants' method and product differ substantially from this reference.

It is believed the claims as amended are neither anticipated nor obvious in view of the cited art and their favourable consideration and allowance are earnestly solicited.

Respectfully submitted,

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